# 6

# Peru after Privatization: Are Telephone Consumers Better Off?

MÁXIMO TORERO, ENRIQUE SCHROTH,
and ALBERTO PASCÓ-FONT

Over the last decade, Peru's telecommunications market has undergone fundamental changes resulting from market liberalization, privatization, technical progress, and changes in consumer demand. These forces have had direct, long-term effects on consumers and providers. To evaluate this process and assess the effects of these changes, this chapter focuses on one of the greatest forces that has changed Peru's telecommunications industry: privatization of the Peruvian Telephone Company (CPT) and the National Telecommunications Company (ENTEL), which Telefónica de España purchased in 1994.

Today, a decade after privatizing Peru's telecommunications market, its overall effect is still puzzling. More people, mainly at the lower socioeconomic levels (SELs), have access to a telephone. On the other hand, many potential consumers do not take advantage of this option, presumably because they cannot afford the flat monthly charge.

In this chapter, we estimate the effects that various changes in telephone services resulting from privatization have had on consumer welfare at different SELs. We analyze the benefits to consumers of having greater access to telephone lines, along with the cost of the simultaneous increase in monthly telephone tariffs. We measure changes in consumer welfare to

*Máximo Torero is a research fellow at the International Food Policy Research Institute. Alberto Pascó-Font was the director of the Group of Analysis for Development (GRADE). Enrique Schroth is assistant professor at the University of Lausanne, Switzerland.* *This research was supported by a research grant from the Tinker Foundation. The authors are indebted to the comments of Sebastian Galiani, Miguel Urquiola, Paul Gertler, John Nellis, and a remarkably talented team of research assistants: Virgilio Galdo, Eduardo Maruyama, and Gisselle Gajate.*

determine whether the gains (i.e., more people with access to a telephone line) offset the higher tariffs, particularly the increased, flat monthly charge.

## Sector Overview: The Road to Privatization

Before 1994, the Peruvian telecommunications sector was state-owned. The sector was characterized by a high, unmet demand for access to basic telephone services. Lack of investment and the political control of policies within the firm were responsible for much of this great imbalance. It was assumed that privatization would close the demand gap by boosting efficiency and relaxing the investment constraint, while encouraging development of a competitive market. Indeed, given its degree of development in the mid-1900s, as measured by GDP per capita, Peru should have had a 6 percent ratio of penetration (i.e., 6 out of every 100 households should have had a telephone). Until 1993, the ratio of penetration was 2 percent. The distribution of telephone lines was concentrated in Lima and in wealthier households.

Peru's telecommunications sector was also characterized by distorted tariffs. Installation costs were high (close to $1,000 per residential telephone line in 1993), compared to the international average; however, the flat monthly charge was relatively low. By contrast, tariffs for long distance and additional local calls were high. Like many other countries, Peru assumed that only wealthier consumers used international long distance service; thus, the privatized Telefónica del Perú (TdP) provided a cross subsidy between that service and local telephony. Parallel to the decision to privatize the sector, the Peruvian government decided to rebalance tariffs to reflect the marginal costs of providing the service. The plan was to phase in the adjustment over five years since a full, immediate adjustment was considered too harsh for the welfare of consumers (indeed, the monthly charge for basic service would have increased from $1 to $17). During the five-year adjustment period (1994–98), TdP was permitted to reduce the cross subsidies gradually and finally eliminate them.

### Privatization Strategy

The economic reforms implemented in early 1990 by the administration of Alberto Fujimori included privatization of companies in which the state had held a sizeable share. Between November 1991 and February 1992, the Peruvian government put into effect a comprehensive privatization strategy; it defined the methods and prioritized sectors according to their economic significance, potential ease of privatization, and degree of crisis faced. It created Special Privatization Committees or CEPRIs to promote and facilitate this process.

Until 1994, two state-owned companies—CPT and ENTEL—provided telecommunications services. CPT provided local telephony service in metropolitan Lima, while ENTEL served the rest of the country and handled national and international long distance services. The government had organized the sector in this way through the 1970 Telecommunications Act, which considered the sector strategic and therefore kept domestic and foreign private businesses from participating in it.

Under this scheme, all infrastructure investment was undertaken by the public sector. However, because of low tariffs and limited management capacity, the sector experienced little growth, inadequate coverage, and low-quality service.

To manage privatization of the sector, the Fujimori administration passed the Telecommunication Law in 1991 and formed the Telecommunications CEPRI, which issued an international call for bids and set the base price at $546 million. Three consortia responded to the call for bids:

- Telefónica de España, Graña y Montero, Backus, and Banco Wiese;
- Southwestern Bell, Korea Telecom, Daewo Telecom, Condumex-Carso, and Banco de Crédito; and
- GTE, Compañía Portuguesa, and Empresa Brasilera de Telecomunicaciones.

The winning consortium, headed by Telefónica de España, offered $2.002 billion, almost four times the base price, for a 35 percent share in CPT and ENTEL. Of the remaining 65 percent of shares, minority shareholders held 36 percent and the Peruvian state retained 29 percent. Consequently, the privatization process did not conclude in 1994. In July 1996, the state sold off 26.6 percent of its shares through a diversified operation to small and individual shareholders.

## Toward a Competitive Sector

The privatization agreements called for a merger of CPT and ENTEL. However, the two entities were required to keep separate accounts. The agreements also established a five-year period of limited competition, during which new competitors could not provide basic telephony services. Remaining telecommunications services (value-added services, mobile telephony, data transmission, e-mail, and cable television) were open to immediate competition.

In exchange for granting this partial natural monopoly, the government required the operator (the winning bidder) to meet goals for expanding service and improving quality. Consequently, expansion and modernization goals in the concession contract called for a total of 1,197,600 lines.

**Table 6.1 Maximum rebalancing tariffs, 1994–98**
(in 1994 Peruvian soles)

| Service tariff | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| Basic residential | 12.970 | 14.600 | 18.640 | 25.290 | 31.930 |
| Basic commercial | 21.800 | 25.990 | 29.430 | 30.520 | 31.930 |
| Local call (three minutes) | 0.144 | 0.140 | 0.135 | 0.128 | 0.120 |
| Domestic long distance call (one minute) | 0.575 | 0.519 | 0.458 | 0.416 | 0.371 |
| International long distance call (one minute) | 3,532 | 3,205 | 2,834 | 2,398 | 2,035 |
| Residential installation | 924 | 798 | 672 | 546 | 420 |
| Commercial installation | 1,848 | 1,428 | 1,092 | 756 | 420 |

Note: Exchange tariff in 1994 was 1.6 Peruvian soles per US dollar.

*Source:* OSIPTEL, CPT, and ENTEL concession contract.

The privatization process also established a tariff-rebalancing period in which to gradually reduce existing tariff distortions. The goal was to increase monthly service charges considerably, while reducing the cost of local calls (table 6.1). For reasons discussed below, this period of limited competition ended in August 1998, one year before the date established under the contract.

In July 1993, the government created the Supervisory Agency for Private Investment in Telecommunications or OSIPTEL to replace the Telecommunications Regulatory Commission and regulate and oversee development of the telecommunications market. The 1991 Telecommunication Law, which established a competitive sector framework, gave OSIPTEL technical, economic, financial, functional, and administrative autonomy.

## End of Limited Competition

The period of limited competition for TdP was to have ended in August 1999. However, as noted above, TdP and OSIPTEL mutually agreed to end it one year earlier (August 1998). OSIPTEL decided that TdP had met most of the goals set forth in the 1994 concession contract. The agreement between the two entities called for a series of changes. Two of the most important were

- setting maximum tariffs for the service, applicable until 2001 (this delayed what the contract established—i.e., that the new calculation of prices, including the productivity factor, would enter into effect in 1999); and
- reducing the installation charges from $270 to $150.

With the end of the limited competition period, the government opened the market to new operators willing to provide local, national, and international long distance telephony services. To do so, new operators had to

**Table 6.2 Telephone density of selected countries, 1993**

| Country | Telephone density[a] | Telephone penetration[b] | GDP per capita (US dollars) |
|---|---|---|---|
| Argentina | 12.3 | 27.9 | 6,910 |
| Bolivia | 3.0 | 11.0 | 700 |
| Brazil | 7.5 | 21.0 | 2,550 |
| Chile | 11.0 | 39.1 | 3,035 |
| Colombia | 11.3 | 33.9 | 1,305 |
| Ecuador | 5.3 | 19.7 | 1,150 |
| Mexico | 8.8 | 25.3 | 3,880 |
| Peru | 2.9 | 10.1 | 1,450 |

a. Lines per 100 inhabitants.
b. Lines per 100 households.

*Source:* World Telecommunications Indicators, International Telecommunications Union (ITU 1993).

pay TdP an interconnection fee, [1] i.e., a charge for using TdP-owned infrastructure. As has been the case in other countries with liberalized telecommunications sectors, new entrants have not, to date, been able to reach agreement on the fee TdP should charge new competitors.

## Supply-Side Changes

The major supply-side changes that resulted from privatization can be summarized in terms of five indicators: coverage, service quality, tariffs, the company's earnings structure, and its economic efficiency and results.

### Coverage

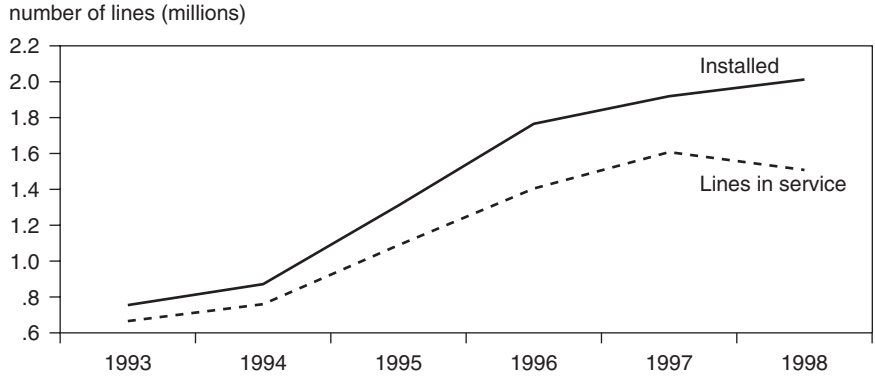
In 1992 and 1993, Peru's penetration was a mere 2.6 lines and 2.9 lines, respectively. This was a low density compared with other countries in the region (table 6.2).

Declining fiscal revenues, the debt crisis, and subsidized tariffs that did not reflect the cost structure limited network expansion. These, in turn, resulted in low levels of telephone density and growing unsatisfied demand. In 1993, Peru's customers had to wait an average of 118 months for line installation, compared with 17 months for customers in Colombia and 11 months for those in Mexico.

In response, one of the first actions of the privatized TdP was to expand the telecommunications network to satisfy unmet demand. Figure 6.1 clearly

1. The maximum fee for daytime interconnection was first set at $0.029 per minute, which was much higher than fees charged in Chile ($0.017) or Mexico ($0.022).

**Figure 6.1 Evolution of the number of lines installed and in service, 1993–98**




*Source:* OSIPTEL (1998b).

shows the process of network expansion between 1993 and 1998 and the overall increase of approximately 167 percent in the number of lines installed.

In terms of coverage, TdP amply met the goals set forth in the concession contract (table 6.3). By 1998, TdP had already covered the entire market for basic telephony, which may explain why it decided to advance the date for ending the limited competition period. Decreasing growth in the number of lines in service, which occurred around 1998, could have indicated overcoverage in the sector (figure 6.1).

## Service Quality

Before privatization, service quality was well below international standards. In 1992, only 35 to 40 percent of all phone calls were successfully completed. Such low efficiency was caused, in part, by the network's small size and obsolete technology. In addition, inadequate maintenance of telephone cables affected quality of communications (cables have a useful life of 15 years; by 1993, some had been in use for more than 60 years). In 1993, only 33 percent of the network had been digitized. By 1998, 90 percent had been digitized, and 99 percent of international long distance and local calls were successfully completed.

## Tariffs

The low level of investment by CPT and ENTEL can be partially attributed to the companies' low earnings as, over time, telephone-service charges fell increasingly behind costs. This kept these state-owned companies from generating the funds needed to finance network expansion or

quality improvements. In effect, sociopolitical, rather than technical, criteria guided tariff administration. The government subsidized local telephony services by charging well above the cost of tariffs for international long distance and other services. As a result, approximately 5 percent of ENTEL clients provided 29 percent of its earnings, and 6 percent of CPT clients provided 28 percent of its earnings.

Though many other countries in the region had this type of cross subsidy, Peru differed substantially in its telephone-service tariff. For example, in 1993, the price of installing a telephone line in Peru was $1,500 (well above the average for Latin American countries), while it had a low basic monthly tariff of $2; for those who used more than the minimum service, the excess tariff was extremely low. Conversely, the tariff for international long distance service was extremely high.

The contract established the average maximum rebalancing tariffs, which increased basic monthly tariffs and lowered costs of local, national, and international long distance calls. Figure 6.2 shows the evolution of the index of the basic tariff and cost of a local call. Table 6.4 shows the evolution in real terms of the tariffs for local, national, and international long distance calls.

TdP markedly raised the price of monthly service, almost doubling it in nominal terms, and raised the charge for a local call by changing the unit of measurement, in 1998, from a three-minute to a one-minute pulse.

## Earnings Structure

During the period of state ownership, the amount of international traffic each company handled was markedly disproportionate to its assigned sector. CPT generated 86 percent of outgoing and 90 percent of incoming international traffic, while ENTEL generated the remaining 14 percent and 10 percent, respectively. This situation, along with ENTEL's exclusive concession to outgoing, international long distance service and lack of an interconnection policy, resulted in conflicts between the two companies over interconnection charges. As a consequence, they stopped making transfers for interconnection services.

Following privatization, important changes have occurred in earnings composition. Local telephony has become the most important service category, while earnings for national and international long distance services have fallen proportionately. These results were foreseen in the tariff-rebalancing scheme. Furthermore, an observable increase in earnings has occurred in mobile telephony, business communications, and publicity.

## Efficiency and Economic Results

CPT and ENTEL had an excessive number of employees proportionate to their scale of activities and low productivity. For example, at one time,

**Table 6.3 Compliance with the program to expand and modernize the sector, 1994–98** (thousands)

| Item | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| Additional lines to be installed | 104.00 | 140.00 | 216.00 | 259.30 | 259.30 |
| Additional lines installed | 116.68 | 439.24 | 445.71 | 203.92 | n.a. |
| Lines to be replaced | 20.00 | 30.00 | 50.00 | 50.00 | 50.00 |
| Lines replaced | 63.49 | 111.78 | 45.10 | n.a. | n.a. |
| Public telephones to be installed | 2.10 | 3.50 | 4.40 | 4.50 | 4.50 |
| Public telephones installed | 5.17 | 15.54 | 14.64 | 3.64 | n.a. |

n.a. = not available

*Source:* Telefónica del Perú, annual reports (1994–98).

ENTEL's Lima office had 3,700 employees, an extremely high figure, considering that the company's scope of operations did not include Lima. Another indicator of the inefficiencies within both CPT and ENTEL was their structure of operating costs. In 1992, CPT allocated 40 percent of its costs to wages and salaries, in contrast to ENTEL, which allocated 20 percent (Coopers & Lybrand, Morgan Grenfell, and ProInversión 1993). The results were high operating costs per telephone line and low profits.

Table 6.5 presents the results achieved by TdP in terms of efficiency and profits. The gains in efficiency are obvious (measured by the number of lines per employee). Accordingly, profitability is also high.

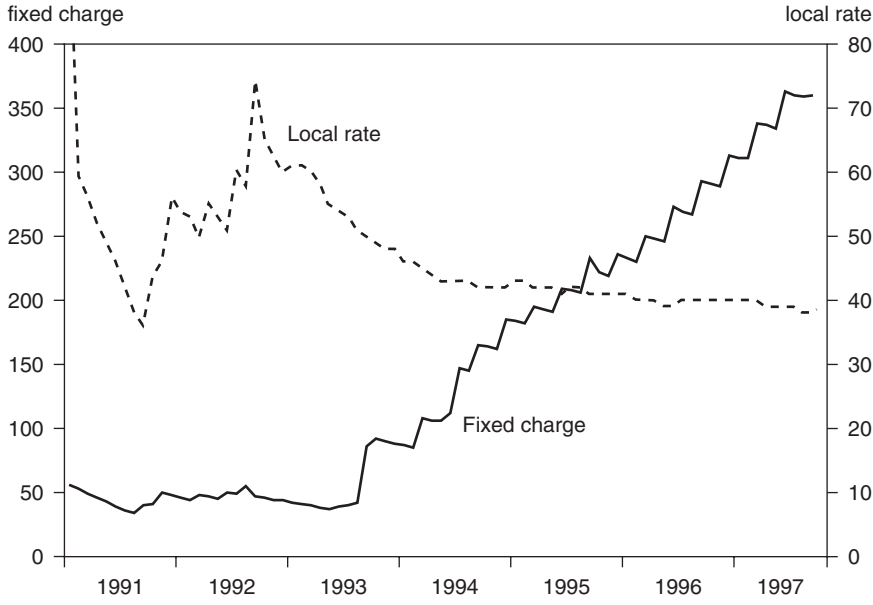
## Methodology for Measuring Consumer Welfare

To determine whether privatization was regressive and which types of households (classified by their observable characteristics) bear a greater portion of the burden or enjoy a greater portion of the benefits of the price changes resulting from privatization, this study used an approach that differs from previous efforts (e.g., Galal et al. 1994; Martin and Parker 1997).

Unlike the cited studies, we did not build welfare measurements for each interest group involved in the privatization to obtain indicators of aggregate welfare.[2] Although we used certain concepts developed by the cited works, we devised a different model to put a value on consumer welfare before and after privatization and to measure the net effects on consumers: We estimated a partial demand equation for access to and use of the various telecommunications services. This allowed us to evaluate the effects of privatization of all services offered by TdP on consumer welfare. We used a specific panel of households surveyed by GRADE, a Peruvian research institute, in 1997, concerning household use and consumption of

2. Jones, Tandon, and Vogelsang (1990, 21–51) discuss in detail the construction of these indicators.

**Figure 6.2 Evolution of the basic local-tariff index, 1991–97**




*Source:* Central Bank of Peru Weekly Notes.

telecommunications services for which monthly consumption for each service had been collected over the previous year.

Two prior GRADE studies conducted at OSIPTEL's request (Escobal, Fry, and Schroth 1996; Gallardo and Galdo 1998b) and a third study by OSIPTEL (1995b) provided data that allowed us to estimate key parameters.[3] The GRADE studies estimate functions of residential demand for access to and use of local and long distance services, using a household survey. The OSIPTEL study reports average costs of each service provided by TdP (e.g., residential access, local calls, long distance calls, mobile calls, and value-added services).

## Market Models

The next step was to model the market for each product under the preprivatization and postprivatization scenarios. The model envisioned the demand for specific telecommunications services as a two-stage decision rule. In deciding whether to request a telephone line, and given the price

3. Using studies from other countries is often arbitrary because the characteristics of these experiences differ from the Peruvian context.

**Table 6.4 Evolution of telephone tariffs, 1993–98**
(in 1995 Peruvian soles)

| | | Nominal | | | | Real | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | IPC | Rent | Local | DLD | ILD | Rent | Local | DLD | ILD |
| 1993 | 0.820 | 5.000 | 0.170 | 0.484 | 4.860 | 1.000 | 0.034 | 0.097 | 0.972 |
| 1994 | 0.946 | 11.990 | 0.180 | 0.628 | 3.860 | 1.000 | 0.015 | 0.052 | 0.322 |
| 1995 | 1.000 | 14.166 | 0.185 | 0.629 | 3.871 | 14.136 | 0.185 | 0.629 | 3.874 |
| 1996 | 1.166 | 25.150 | 0.207 | 0.618 | 3.824 | 1.000 | 0.008 | 0.025 | 0.152 |
| 1997 | 1.241 | 36.670 | 0.213 | 0.603 | 3.477 | 1.000 | 0.006 | 0.016 | 0.095 |
| 1998 | 1.316 | 43.220 | 0.234 | 0.444 | 3.360 | 1.000 | 0.005 | 0.010 | 2.547 |

DLD = domestic long distance
ILD = international long distance
IPC = indice de precios al consumidor

Note: 1995 average, otherwise end of the period.

*Source:* OSIPTEL (1998b).

for use of the telephone service, consumers compare their surplus to the service charges they would have to pay. Using this framework, we estimated functions of demand from private households and businesses for access to and use of a range of services. Using these estimations, we compared the situations before and after privatization.

The estimated demand functions identified all relevant factors for determining the position on the demand curve, given observed price, quantity, and, in the case of access, statistics of waiting lists. Because the demand functions were estimated from a panel of households that evidenced variations in prices, income, and demographic characteristics, we could directly calibrate the position of each curve at different points of time without needing additional assumptions for unobserved variables.

Furthermore, the calibration could be less arbitrary than those used in previous studies since it was unnecessary to assume linearity for the demand curves. In fact, we chose the functional form of the demand curves in order to obtain the best fit rather than achieve algebraic simplicity (Escobal, Fry, and Schroth 1996).

In this study, we associated access to the main telephone services with each of their corresponding services. We identified the following access services that TdP has provided for residential lines:[4]

- local calls,
- domestic long distance calls, and
- international long distance calls.

4. This study covers only the cities of Arequipa, Chiclayo, Cuzco, and Trujillo and will be complemented by a similar study financed by the Tinker Foundation for the city of Lima.

**Table 6.5 Performance indicators, 1994–98**

| Indicator | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| Lines installed (per employee) | 98.0 | 155.0 | 281.0 | 329.0 | 355.0 |
| Lines in service (per employee) | 87.0 | 132.0 | 228.0 | 282.0 | 275.0 |
| Lines in service (per 100 inhabitants) | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 |
| Waiting time (months) | 33.0 | 5.0 | 2.0 | 2.0 | 1.5 |
| Net profits (in millions of US dollars) | 35.5 | 305.1 | 348.3 | 400.5 | 213.0 |
| Net profits/earnings (percent) | 5.0 | 29.4 | 28.8 | 24.9 | 16.9 |
| Net profits/equity (percent) | 2.9 | 21.1 | 28.8 | 24.9 | 15.7 |

*Source:* Telefónica del Perú, annual reports (1994–98).

## Changes in Access and Use

The next step aimed to discover changes in welfare caused by privatization only, not by other changes that may have occurred had the telecommunications sector remained under state ownership and control. For this purpose, we assumed that the magnitude and levels of price increases would not have occurred in the absence of privatization.

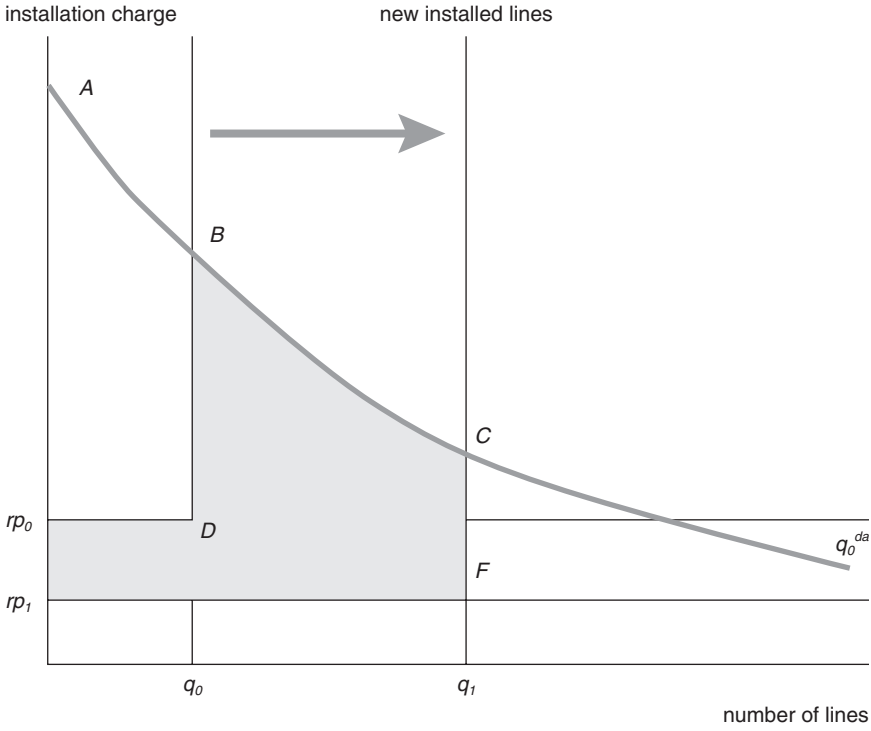
After calibrating the demand functions to approximate the result observed using the information on lines of access, changes for basic service and installation, and number of potential subscribers on a waiting list, we then measured consumer welfare five years before and five years after privatization. It became clear that the reduction in installation costs and the progressive reduction in the waiting time for installation would significantly raise consumer welfare above its preprivatization levels.

Figure 6.3 illustrates how simultaneously increasing the number of lines installed and reducing access charges affect consumer welfare. In this particular case, the average charge for monthly service (the sum of the charge for basic service and the one-time, installation payment divided into monthly installments) falls from $rp_0$ to $rp_1$. The demand function, $q^{da} = q^{da}(p, y, x)$, in which $p$ is a vector of all relevant prices (average charge for basic monthly service, complementary and substitute goods), $y$ is the income, and $x$ is a vector of other causal variables, can also be expressed inversely, $rp^{da} = rp^{da}(q, y, x)$, to reflect the maximum price that a home defined by the pair $(y, x)$ is willing to pay for access to a telephone line. Given these charges and a restriction on supply, expressed as $q_0$, a waiting list is given by the difference of $q^{da}(rp_0, y_0, x_0) - q_0$. Given that the number of lines installed increased to a level of $q_1$, the new waiting list time is then $q^{da}(rp_1, y_1, x_1) - q_1$.

According to figure 6.3, the components to be estimated would be the areas $ACFrp_1$ and $ABDrp_0$. The difference between them (the shaded area) would yield the increase in consumer surplus resulting from more households having access to residential lines.[5] Once the demand function was

5. The method of estimation would be the same for commercial users.

**Figure 6.3 Welfare effects of relaxed supply restrictions and the change in regulated prices on telephone-line access market**




*Source:*

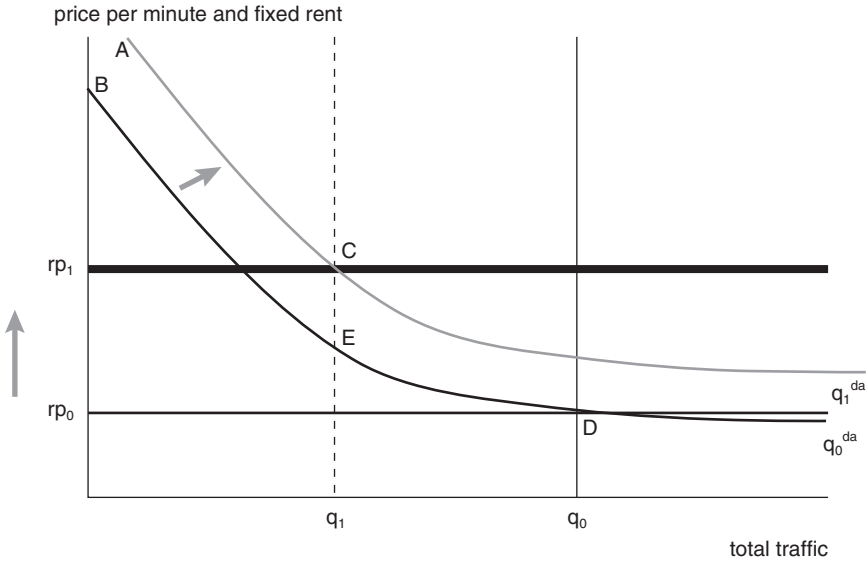
known and its position calibrated, one could directly register this increase, as follows:

$$\int_{q_0}^{q_1} p(q, x_0, y_0) + rp_0 \cdot q_0 - rp_1 \cdot q_1 \tag{6.1}$$

As mentioned above, one also needed to estimate the welfare effects of using a specific service (i.e., a telephone line) on consumer surplus. During the first five years of the concession, cross subsidies were eliminated, charges for access and international long distance service were reduced, and tariffs for local services were increased. Consequently, a complete measurement of the change in consumer surplus for basic telephony services requires adding the welfare gains resulting from access to the potential reductions derived from increased local-service tariffs.

Once the demand functions and the observed quantities and prices were known, registering the consumer surplus would become a straightforward

**Figure 6.4 Welfare effects of changes in regulated prices and increase in number of users on market for telephone-line services**




task, given that consumers no longer have to be on a waiting list for service. The demand functions estimated for the use of local and long distance services (i.e., demand for calls) include the effects of a new equilibrium on the access market, which is reflected by a displacement of the demand function from $q_0^d$ to $q_1^d$. The specifications include the number of lines in service, as an explanatory variable, as a way to incorporate network externality effects (Taylor and Kridel 1990).

Figure 6.4 provides an example of the effects of simultaneous increases in access lines and charges per minute for any type of call available to residential lines (local, national, and international long distance calls). The increase in number of access lines is caused by the reduction in cost of access (from $rp_0$ to $rp_1$) and is represented by the displacement of the demand curve to $q_1^{da}$. Furthermore, the increase in the charge per minute for calls is represented by the change in price (from $p_0$ to $p_1$).[6]

Thus, to register the change in consumer welfare, we simply evaluated the following:

$$\int_0^{q_1} p(q, x_1, y_1)dq - \int_0^{q_0} p(q, x_0, y_0)dq + p_0 \cdot q_0 - p_1 \cdot q_1 \qquad (6.2)$$

6. Based on the tariff-rebalancing program shown in table 6.1.

This equation is equivalent to the difference between the areas $ACp_1$ and $BDp_0$.

Clearly, there was no reason to infer an increase or reduction in consumer surplus as a result of the simultaneous changes. Furthermore, in some markets, regulated charges per call had increased (local exchange), while charges for other services had decreased (international long distance). Consequently, to evaluate the consumer-welfare implications of privatizing CPT and ENTEL precisely, we had to compare the gains arising from relaxing supply restrictions on the access market with changes in welfare arising from all associated consumer services.

We next estimated and then evaluated the income-distribution effects of price increases, and determined which types of households shouldered a greater portion of the burden or enjoyed more benefits of these price changes. This allowed us to estimate the effects of privatization and delineate whether these changes in price scenarios were a net gain or loss to the welfare of Peruvian households.

## Estimating Demand

We started from the premise that household preferences are represented by a utility function:

$$u = u(x_{local}, x_{ldn}, x_{ldi}, z) \tag{6.3}$$

in which $x_l$ is the total amount that a residential customer consumes of each service available (local, national, and international long distance calls), and $z$ is an index of the consumption of other goods. Solving the optimization problem, we derived the indirect utility function, $V(p,y)$, in which $y$ is the income of each household and $p$ is a vector with the prices of the three basic services and a general index of prices for the remaining goods.

A household chooses the services it will use on the basis of access to lines. In making its decision, it compares the value of using the services $V(p,y)$, given the prices, with the cost of access attributable to that period. In this case, having access to a line allowed a customer to make any of the three types of calls mentioned. In households for which we were able to obtain a telephone bill, we observed that some made only local calls while others made local and long distance calls. This characteristic allowed us to order the households based on their consumption decisions. However, data restrictions prevented our demand estimations from capturing changes in quality of telephone services.

Econometrically, we modeled the demand for a specific telecommunications service as a two-stage decision rule. First, we modeled the decision to access the network using a probit model. From this equation, we obtained the Mills inverse ratio to correct for the access problem. This ratio was included in demand estimations to obtain price elasticities and consumer

surpluses for the three services under study, correcting for the bias for lack of access.

## Measuring Consumer Surplus

Using the estimations of demand at the residential level, we obtained a functional form for the demand for use of local, national, and long distance services. This demand curve represents households that, at that point in time, had access to a telephone line.

According to the Living Standards Measurement Survey (LSMS), the functional form that yielded the best fit—for all of Lima's SELs, those surveyed in four other major Peruvian cities, and later for the whole of urban Peru—was

$$q_{it}^{n} = \exp(x_{it}\beta^{n} + p_{it}\alpha^{n} + \varepsilon_{it}) \tag{6.4}$$

The superscript $n$ indicates the SEL, $i$ equals the household, and $t$ equals time. The relevant prices are $p_{it}$; thus, the elasticities are recovered from the estimators of the parameters, $\alpha$, for each SEL. Lastly, $q_{it}$ is the traffic measured for each of the three services considered in this study.

The basic idea is to measure consumer surplus as the difference between the surplus for making a certain number of calls at a specific point in time and the fixed amount paid for access to the line.[7] Thus, for a given SEL, we define

$$S_{it}^{j}(p_{it}, .) = \int_{P_t}^{P_{\max}} q_{it}^{j}(p, .)dp, \forall j \in \{Local, DLD, ILD\} \tag{6.5}$$

as the consumer surplus for using the line for any of the three services and $r_{it}$ as the annual installment made on the flat installation charge. Then

$$\tilde{S}_{it}(p_{it}, r_{it}) = \sum_{j} S_{it}^{j}(p_t) - r_{it} \tag{6.6}$$

measures the total net surplus of all services.

Replacing the functional form given in equation 6.6, and solving the equation, one obtains the surplus as

$$\tilde{S}_{it}(p_{it}, r_{it}) = -\frac{1}{\alpha^{j}} \exp(x_{it}\beta^{n} + p_{it}\alpha^{n} + \varepsilon_{it})\Big|_{p_{it}}^{p\max} - r_{it}$$

$$\tilde{S}_{it}(p_{it}, r_{it}) = -\frac{1}{\alpha^{j}} \exp(x_{it}\beta^{n} + p'\alpha^{n} + \varepsilon_{it}) - r_{it} \tag{6.7}$$

in which $\alpha^{j}$ is the elasticity of the price itself.

7. The value of the flat installation charge converted into a perpetuity (e.g., annualized) value.

## Household Survey

For Peru's urban population, we used a household panel surveyed especially for this study. We applied the survey to 7.6 million residents, who accounted for more than 50 percent of the country's urban population and more than 80 percent of its fixed telephone installations. The total sample size of 1,708 urban households, selected during the 1996–97 period, was constructed to be representative of residential demand for telephony services in metropolitan Lima and Peru's principal provincial cities. In metropolitan Lima, the 907 households selected were grouped into high, middle, low, and very low SELs. In the four other cities—Cuzco, Arequipa, Chiclayo, and Trujillo—801 households were chosen and grouped into the four SEL categories (Pasco-Font, Gallardo, and Fry 1999).

The survey questionnaire consisted of five sections:

- present use and quality of telecommunications services,
- household's potential use of services,
- household characteristics,
- household-member characteristics, and
- information from the household telephone bill.

The study also required information, by SEL, on the number of families and the telephone penetration tariff. For metropolitan Lima, the data source was the SEL report prepared by Apoyo S. A. The penetration tariffs reported in the tables were weighted by size of households in each SEL. No similar information was available for the provincial cities for the period studied.[8] Consequently, we estimated the number of households and used the penetration tariff of the middle SEL of metropolitan Lima. As input for estimating the number of households, we used the final results of the 1993 National Census.

### Results Using Household Surveys for Lima and Four Major Cities

Based on estimates of demand for basic telephony services, we computed household welfare changes for the four SEL categories (A, B, C, and D).[9] We also used Torero's results for households in SELs A and B in Cuzco, Arequipa, Chiclayo, and Trujillo (Torero and Pasco-Font 2000).

8. Information was available only for 1996 for the cities of Arequipa, Chiclayo, and Trujillo.

9. SELs were grouped according to income and other characteristics, with category A comprising the wealthiest households and category D the poorest.

Tables 6.6 and 6.7 provide details of the results obtained and the demand estimates for the cities studied. Each table presents three models. The first corrects for the selection bias resulting from (1) whether consumers had a telephone, and (2) households for which telephone bill information could not be obtained. The second model corrects only for the first selection bias. The third model includes a dummy variable identifying whether the household has a cellular phone.[10] Although all three models are correct, the third is more econometrically sound because it incorporates both types of selection (i.e., by access and charges billed).

Results for the cities studied exhibited the expected signs and coefficients. Thus, the tariff for the respective service is significant and has the expected negative sign. Furthermore, the price of international long distance service is significant (and has a positive sign) in explaining the use of local service and national long distance service, indicating a degree of substitution between the two products. Lastly, household demographic characteristics (education and income) are significant and have the expected signs. We also included fixed-district effects for the Lima estimates and those of the cities included on the panel for the rest of Peru. In both cases, the F statistical test demonstrated that the fixed effects were significant overall.

Based on these estimates and deriving equation 6.4 with regard to price, we recovered the price elasticities of use demand for each of the three services studied. As table 6.8 shows, demand for local and domestic long distance services was inelastic in the cities studied. This result is consistent with many other studies,[11] including those of Pasco-Font, Gallardo, and Fry (1999);[12] Doherty (1984); Zona and Jacob (1990); Gatto et. al. (1988); Duncan and Perry (1994); and Levy (1996).

Using the demand elasticities obtained from these estimates, the next step was to measure the welfare effects for local, national, and international long distance calls. We also included the effect of increases in the flat, monthly service charge on each household's surplus, in terms of having the fixed residential service, following the methodology set forth in the preceding section.

---

10. Accounting for access to cellular phones is crucial, especially since 1997, when intensity of use increased substantially. From 1993 to 1998, the density of cellular phones jumped from 0.2 to 3; however, as this study's results show, cellular phones complement, rather than substitute for, possession of a fixed-line phone, thereby increasing expenditures resulting from calls from fixed-line phones to cellular ones.

11. Elasticities in these studies ranged from –0.21 to –0.475. See Pasco-Font, Gallardo, and Fry (1999) for further details.

12. Although this study used the same data that Pasco-Font, Gallardo, and Fry (1999) used, it estimated demand using a different method that incorporated people who did not provide information from their telephone bills into the correction for selection bias. In addition, this study included the difference in price, based on the time calls were made, into the calculation of implicit prices.

**Table 6.6 Estimate of local telephone demand in metropolitan Lima**

| | Local calls | | | National long distance calls | | | International long distance calls | | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Model 1** | **Model 2** | **Model 3** | **Model 1** | **Model 2** | **Model 3** | **Model 1** | **Model 2** | **Model 3** |
| Local rate | –2.50** | –2.44** | –2.70** | –3.62 | –3.45 | –3.61 | 3.28 | 3.27 | 3.63* |
| | (1.08) | (1.065) | (1.145) | (2.388) | (2.366) | (2.386) | (2.069) | (2.067) | (2.017) |
| International long distance rate | 0.47*** | 0.47*** | 0.57** | 0.23** | 0.22** | 0.23** | –0.30** | –0.30** | –0.30** |
| | (.145) | (.145) | (.229) | (.101) | (.1) | (.101) | (.133) | (.133) | (.129) |
| Domestic long distance rate | –0.03 | –0.03 | –0.07 | –0.76** | –0.77** | –0.76** | 0.47** | 0.47** | 0.17 |
| | (.026) | (.026) | (.069) | (.375) | (.375) | (.375) | (.257) | (.258) | (.312) |
| Rate of penetration in Lima (network externality) | 1.55*** | 1.50** | 1.68*** | | | | | | |
| | (.481) | (.479) | (.478) | | | | | | |
| Relatives in provinces | | | | 0.80*** | 0.80*** | 0.80*** | | | |
| | | | | (.101) | (.101) | (.101) | | | |
| Relatives abroad | | | | | | | 0.42*** | 0.42*** | 0.44*** |
| | | | | | | | (.08) | (.079) | (.08) |
| Household with cellular phone | | | 0.25* | | | –0.06 | | | 0.82*** |
| | | | (.13) | | | (.203) | | | (.212) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Constant | 4.33*** | 4.27*** | 4.41*** | 0.33 | 0.46 | 0.33 | –0.31 | –0.21 | –0.25 |
| | (.378) | (.37) | (.447) | (.729) | (.715) | (.73) | (.697) | (.691) | (.687) |
| Mills inverse ratio (reported bill) | –0.35*** | | –0.36*** | –0.16 | | 0.16 | 0.16* | | 0.15* |
| | (.075) | | (.075) | (.115) | | (.115) | (.091) | | (.091) |
| Mills inverse ratio (has telephone) | | –0.48*** | | | –0.34** | | | 0.16 | |
| | | (.102) | | | (.156) | | | (.126) | |
| Observations | 2021 | 2021 | 2021 | 1993 | 1993 | 1993 | 1940 | 1940 | 1940 |
| F-test | 39.18 | 39.27 | 37.71 | 14.94 | 14.89 | 14.47 | 8.63 | 8.61 | 8.72 |
| Prob > F-test | 0.0000 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| R-squared | 0.4472 | 0.4471 | 0.4489 | 0.1802 | 0.1813 | 0.1802 | 0.107 | 0.106 | 0.129 |

* = significant at 90 percent
** = significant at 95 percent
*** = significant at 99 percent

Note: First three regressions correspond to the demand for local calls (minutes), the second three for the demand of national long distance calls, and the last three for the demand of international long distance calls. Within each dependent variable, three models are presented. The first model corrects not only for the selection bias resulting from whether consumers have a telephone but also for the selection bias caused by households for which telephone bill information could not be obtained. The second model, on the other hand, corrects only for the selection bias for consumers having a telephone. Finally, the third model includes a dummy variable identifying whether the household possesses cellular phones. Standard errors are in parentheses. Robust standard errors account for sample clustering and stratification. Demographic controls include: household income, household income squared, percentage of young people in the household (13–24 years old), percentage of young females in the household (13–24 years old), household size, and education-degree level of household head. Additionally all regressions include district fixed effects, and the F-test was significant, with $p < 0.001$.

## Table 6.7 Estimate of local telephone use demand outside metropolitan Lima

| Variable | Local calls | | | National long distance calls | | | International long distance calls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Local rate | –2.52** | –2.50** | –2.74** | –4.12*** | –4.12*** | –4.44*** | –0.02 | –0.02 | –0.07 |
| | (1.09) | (1.086) | (1.026) | (1.613) | (1.612) | (1.469) | (.393) | (.395) | (.406) |
| International long distance rate | 0.13 | 0.14 | 0.09 | –0.13 | –0.12 | –0.17 | –0.43** | –0.43** | –0.43** |
| | (.174) | (.175) | (.174) | (.155) | (.155) | (.162) | (.197) | (.195) | (.194) |
| Domestic long distance rate | –0.17** | –0.16** | –0.20** | –0.89*** | –0.88*** | –0.93*** | 0.04 | 0.04 | 0.03 |
| | (.085) | (.083) | (.08) | (.267) | (.267) | (.266) | (.147) | (.145) | (.148) |
| Relatives in provinces | | | | 0.65*** | 0.65*** | 0.61** | | | |
| | | | | (.248) | (.248) | (.246) | | | |
| Relatives abroad | | | | | | | 0.23*** | 0.22*** | 0.22*** |
| | | | | | | | (.032) | (.032) | (.033) |
| Household with cellular phone | | | 0.49*** | | | 0.67*** | | | 0.13 |
| | | | (.105) | | | (.191) | | | (.138) |
| Constant | 5.03*** | 4.99*** | 5.33*** | 2.72*** | 2.51** | 3.05*** | 1.49** | 1.68** | 1.55** |
| | (.605) | (.513) | (.594) | (.98) | (.885) | (.987) | (.762) | (.738) | (.753) |
| Mills inverse ratio (reported bill) | –0.22* | | –0.23* | –0.11 | | –0.11 | –0.06 | | –0.06 |
| | (.126) | | (.125) | (.197) | | (.197) | (.101) | | (.102) |
| Mills inverse ratio (has telephone) | | –0.48*** | | | –0.06 | | | –0.30 | |
| | | (.153) | | | (.264) | | | (.119) | |
| Obs. | 1367 | 1367 | 1367 | 1348 | 1348 | 1348 | 1356 | 1356 | 1356 |
| F-test | 18.84 | 19.99 | 20.70 | 9.04 | 8.89 | 9.31 | 5.56 | 5.7 | 5.25 |
| Prob > F-test | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| R-squared | 0.143 | 0.147 | 0.154 | 0.094 | 0.094 | 0.103 | 0.094 | 0.098 | 0.096 |

* = significant at 90 percent
** = significant at 95 percent
*** = significant at 99 percent

Note: See table 6.6.

**Table 6.8 Price elasticities of use demand**

| City | Service | Elasticity |
|---|---|---|
| Lima[a] | Local | –0.494 |
| | Domestic long distance | –0.478 |
| | International long distance | –1.095 |
| Province cities[b] | Local | –0.689 |
| | Domestic long distance | –0.548 |
| | International long distance | –1.585 |

a. Metropolitan Lima (SELs A, B, C, and D).
b. Arequipa, Chiclayo, Cuzco, and Trujillo (SELs A and B).

Given the functional form of our directly estimated demand functions, when the percentage of change in the tariffs is the same, the percentage of change in a household's welfare is also the same—i.e., the latter does not depend on total consumption, but on the parameters of the demand function. However, the measure of change in consumer surplus varies by household because the flat, monthly service charge represents a different proportion of each household's spending on telephony services. Obviously, this variance is less within the respective SELs because each level comprises households with similar spending patterns for basic telephony services.[13]

13. Appendix table 6A.1 presents detailed results obtained for the four SELs of metropolitan Lima. It first shows the percentage change in the average welfare of the households surveyed—i.e., the changes projected for the years outside of the survey period are representative of the average household in SELs A, B, C, and D that had a telephone at the time the survey was conducted. This part does not incorporate the welfare gains for households that obtained a connection to the fixed network after privatization. By 1995, all households in SEL A had a telephone; thus, the dynamics of joining the network did not affect this calculation. However, for SELs B, C, and D, one would expect the average change in consumer surplus to be underestimated if the dynamics of new entrants joining the fixed network were not considered. Thus, the second half of the table attempts to incorporate the gains in household welfare that resulted from obtaining a connection to the fixed network after privatization. We quantified the number of new households that obtained a telephone line in the following period *(t + 1).* Also, because households that had just obtained a line were not expected to place as much value on the service (because they had not spent a long time on the waiting list), we assigned them the minimum welfare for households in their SEL and pertinent year. Lastly, we again weighted the surplus per home and obtained the change in surplus weighted by access (last column). It should be noted that they performed various simulations assigning different surplus values to the last households that acquired telephone lines, and the percentages of change were not substantially affected. Finally, the table reports the average change in consumer surplus, weighting the change of each component by its relative importance in the total surplus.

Results for other cities are presented in appendix table 6A.2. Although the results are similar to those for metropolitan Lima, the degree of change is smaller because of lower consumption by SELs A and B and a lower penetration ratio. Thus, Chiclayo has practically no drop in percentage of change, while Cuzco experienced the largest drop.

Tables 6.9 and 6.10 summarize this study's main results (appendix tables 6A.1 and 6A.2). Since privatization in 1994, consumer surplus has seen an absolute gain, both by service and SEL, with only a small reduction in growth rate since 1997. However, this analysis of per-household consumer surplus shows that results have not been uniform across SELs.

As tables 6.11 and 6.12 illustrate, while high and medium SELs (A and B, respectively) have experienced a clear gain in welfare, that of SELs C and D has decreased since 1996. For the lowest-income consumers (SEL D), welfare is lower than preprivatization levels, and low-income consumers (SEL C) have received increasing gains per household only since 1996. Moreover, the per-household consumer surplus has a relatively regressive distribution.

The main explanation for the decline in consumer surplus is the permanent increase in the fixed monthly payment (figure 6.2). This price increase had a greater effect on lower SELs because these households use the service less (i.e., they make fewer calls). As a result, a greater proportion of their spending goes to pay the flat monthly charge. There is also a cross-price impact with local calls since the proportionately larger reduction of long distance tariffs has led to a substitution of local calls for long distance ones.

To make matters worse, in 1997, OSIPTEL reduced the unit of measurement for local calls from a three-minute to a one-minute pulse (at a higher equivalent tariff) and expanded the definition of the geographic area. These measures, which translated into an increase in the price of a local call, help to explain the reduction of growth in total consumer surplus since 1997. When Peru's prices for local calls and fixed monthly fees are compared with those of Argentina and Chile—two countries that have also undergone privatization—it is clear that Peru still has room for tariff reduction (figure 6.5).

Thus, although gains have accrued from privatization in terms of increased efficiency, productivity, access, and consumer welfare, further tariff rebalancing is needed to avoid disruption of the benefits of privatization. The steep rise in the fixed monthly tariff, together with higher charges for local calls, has had a direct, negative effect on consumers.

## Summing Up

In the early 1990s, Peru's telecommunications service was characterized by long waiting times, outdated technology, poor service, artificially low prices that failed to cover costs and provide for capital investment, and the capture of firms by workers and unions. As the country became mired in recession, inflation, budget deficits, and balance of payments crises, the situation worsened. However, by the end of the decade, the situation was much improved, mainly as a result of privatizing Peru's two national telecommunications companies, CPT and ENTEL, by Telefónica de España.

## Table 6.9 Estimated total welfare gains in metropolitan Lima, 1993–98

| Service | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| **With direct and cross effect in prices** | | | | | | |
| Local | 11,771,097 | 20,085,738 | 25,000,310 | 29,356,177 | 35,349,003 | 28,826,896 |
| Domestic long distance | 1,409,310 | 1,991,975 | 2,852,576 | 4,496,533 | 5,862,459 | 7,534,980 |
| International long distance | 817,119 | 1,755,544 | 2,432,837 | 3,750,699 | 5,148,160 | 6,061,222 |
| Total | 13,997,525 | 23,833,262 | 30,285,719 | 37,603,409 | 46,359,621 | 42,423,095 |
| Total-fixed charge | 11,322,804 | 17,449,544 | 21,763,703 | 23,703,544 | 27,104,010 | 18,700,779 |
| **Without cross effect in prices** | | | | | | |
| Local | 13,002,981 | 19,516,369 | 25,000,310 | 31,807,954 | 39,417,483 | 40,193,995 |
| Domestic long distance | 1,997,683 | 2,183,086 | 2,852,576 | 4,074,443 | 5,008,968 | 7,106,803 |
| International long distance | 1,503,654 | 1,966,274 | 2,432,837 | 3,188,643 | 3,976,477 | 4,882,022 |
| Total | 16,504,318 | 23,665,729 | 30,285,723 | 39,071,040 | 48,402,929 | 52,182,820 |
| Total-fixed charge | 13,829,596 | 17,282,011 | 21,763,707 | 25,171,175 | 29,147,318 | 28,460,504 |

## Table 6.10 Estimated total welfare gains in rest of Peru, 1993–98

| Service | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| **With direct and cross effect in prices** | | | | | | |
| Local | 573,530 | 1,334,367 | 1,792,757 | 2,207,613 | 2,594,140 | 2,576,037 |
| Domestic long distance | 194,091 | 444,578 | 782,187 | 1,143,480 | 1,430,908 | 2,031,302 |
| International long distance | 75,795 | 121,203 | 142,409 | 170,852 | 195,439 | 219,337 |
| Total | 843,415 | 1,900,147 | 2,717,353 | 3,521,946 | 4,220,487 | 4,826,676 |
| Total-fixed charge | 638,937 | 1,178,908 | 1,522,214 | 1,664,320 | 1,884,881 | 1,793,080 |
| **Without cross effect in prices** | | | | | | |
| Local | 749,316 | 1,401,535 | 1,845,421 | 2,234,657 | 2,594,140 | 2,575,566 |
| Domestic long distance | 674,745 | 753,934 | 952,687 | 1,235,154 | 1,430,908 | 2,093,021 |
| International long distance | 76,722 | 121,108 | 142,178 | 170,907 | 195,439 | 221,892 |
| Total | 1,500,783 | 2,276,577 | 2,940,286 | 3,640,719 | 4,220,487 | 4,890,479 |
| Total-fixed charge | 1,296,305 | 1,555,337 | 1,745,147 | 1,783,093 | 1,884,881 | 1,856,884 |

**Table 6.11 Estimated average per-household welfare gains in metropolitan Lima, 1993–98**

| Service | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| **With direct and cross effect in prices** | | | | | | |
| Local | 40.5 | 57.1 | 59.9 | 54.2 | 55.3 | 37.9 |
| Domestic long distance | 4.6 | 5.3 | 6.3 | 8.1 | 8.7 | 9.7 |
| International long distance | 2.7 | 4.9 | 5.6 | 6.7 | 7.6 | 7.9 |
| Total | 47.8 | 67.3 | 71.8 | 69.0 | 71.7 | 55.4 |
| Total-fixed charge | 39.1 | 50.2 | 52.9 | 44.4 | 43.6 | 24.8 |
| **Without cross effect in prices** | | | | | | |
| Local | 44.7 | 55.5 | 59.9 | 58.7 | 61.7 | 52.8 |
| Domestic long distance | 6.5 | 5.8 | 6.3 | 7.3 | 7.5 | 9.1 |
| International long distance | 5.1 | 5.4 | 5.6 | 5.7 | 5.9 | 6.4 |
| Total | 56.3 | 66.8 | 71.8 | 71.7 | 75.0 | 68.3 |
| Total-fixed charge | 47.6 | 49.6 | 52.9 | 47.2 | 47.0 | 37.7 |

**Table 6.12 Estimated average per-household welfare gains in rest of Peru, 1993–98**

| Service | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| **With direct and cross effect in prices** | | | | | | |
| Local | 12.4 | 25.8 | 30.5 | 34.5 | 37.7 | 36.9 |
| Domestic long distance | 4.2 | 8.6 | 13.3 | 17.6 | 20.9 | 29.2 |
| International long distance | 1.6 | 2.3 | 2.4 | 2.6 | 2.9 | 3.1 |
| Total | 18.2 | 36.7 | 46.2 | 54.7 | 61.4 | 69.2 |
| Total-fixed charge | 13.8 | 22.8 | 25.9 | 26.0 | 27.4 | 25.7 |
| **Without cross effect in prices** | | | | | | |
| Local | 16.2 | 27.1 | 31.4 | 34.9 | 37.7 | 36.9 |
| Domestic long distance | 14.6 | 14.6 | 16.2 | 19.0 | 20.9 | 30.1 |
| International long distance | 1.7 | 2.3 | 2.4 | 2.6 | 2.9 | 3.2 |
| Total | 32.5 | 44.0 | 50.0 | 56.6 | 61.4 | 70.1 |
| Total-fixed charge | 28.0 | 30.1 | 29.7 | 27.8 | 27.4 | 26.6 |

From 1993 to 1998, the Peruvian telecommunication sectors dramatically expanded their network by approximately 167 percent. Moreover, in the early 1990s, telephone density per 100 residents rose from 2.9 to 7.8 lines. Improvement in coverage, quality, and technology was dramatic. By 1998, TdP amply met the expansion and quality goals set forth in the concession contract and covered virtually the entire market for basic telephony. Apparently, this explains why Telefónica and OSIPTEL decided to shorten by one year the limited competition period established under the contract.

With the end of limited competition, the government opened the market to new operators willing to provide local, national, and international long distance telephony services. It also established that new operators could provide these services using TdP infrastructure by paying an interconnection fee.

The privatization process established a tariff-rebalancing period in which to gradually reduce existing tariff distortions. Tariff rebalancing increased monthly service charges considerably, while reducing the cost of local, national, and international long distance calls. This rebalancing schedule affected consumers directly through shifts in prices and access to telephone services.

Compared with other utility sectors, such as water and electricity (Torero and Pasco-Font 2000), Peru's telephony sector has improved dramatically since privatization. While the coverage and quality improvements registered since privatization have been welcome and positive, there is still room for substantial improvement in terms of the distributional impact of privatization. This is largely because more competition is required to reduce tariffs to international standards.

During 1997–98, following three years of postprivatization growth, a significant reduction in household consumer surplus occurred. For Lima, the growth rate of total consumer surplus, compared to the previous period, was –2.4 percent and –3.1 percent when the cross-price effects of this study's equation are included.[14] Outside Lima, the decrease was less important because of the significant increase in access. The negative growth in consumer surplus was even larger, both within and outside Lima, when viewed in terms of average, per capita consumer surplus.[15] Explanations for this reduction in consumer surplus include an increase in the price of local calls, a permanent increase in the price of fixed rent, and the cross-price effect of local calls because of the proportionately greater reduction in prices of long distance calls.[16]

## Conclusions and Recommendations

Although privatization is associated with increased efficiency, productivity, access, and total consumer welfare, a further rebalancing of tariffs is needed to maintain and consolidate its benefits. The steep rise in the fixed monthly tariff, together with the increase in charges for local calls—by reducing the unit of measurement from a three-minute to a one-minute pulse at a higher equivalent tariff—has had a direct, negative effect on consumers.

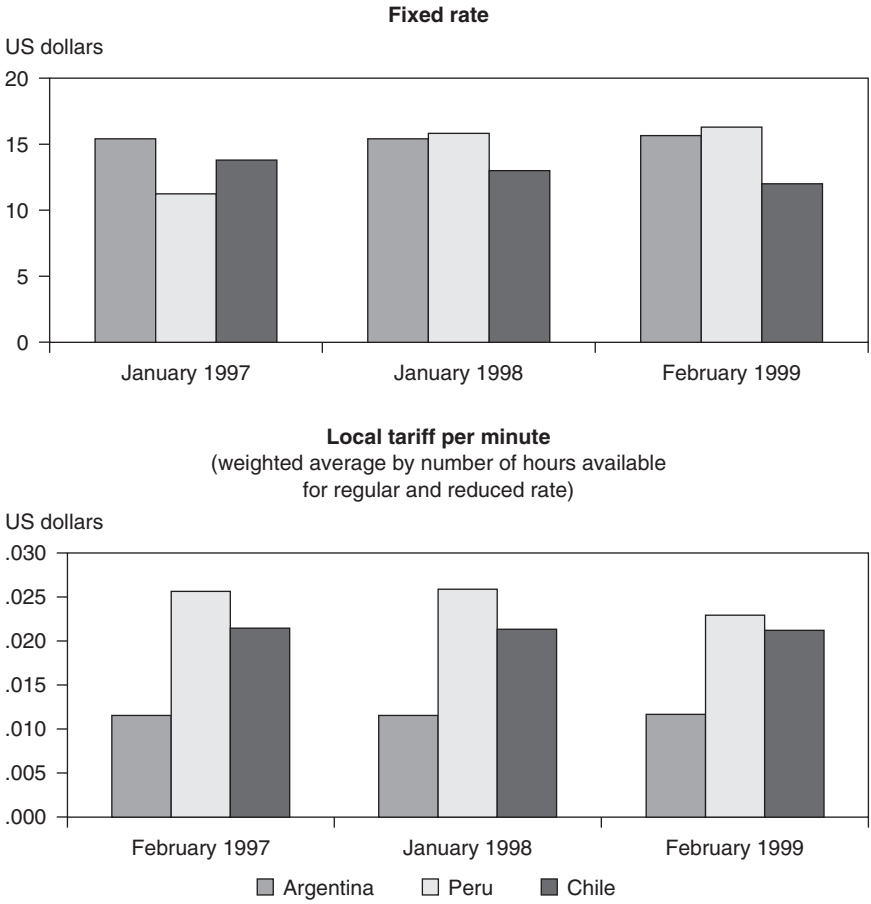
The principal remaining problem is that sector competition is insufficient. Newbery (2000) once mentioned that it should be easy to introduce competition into long distance telephony via entry of new fiber-optic

14. In both cases, we took the fixed tariff into account.

15. For Lima, the decline in consumer surplus was –19.83 when only the direct price effect is included, and –43 percent when the cross-price effect is also included. Outside Lima, the decrease was –2.9 percent and –6.2 percent, respectively.

16. This result implies that local calls are relatively inferior to long distance ones.

**Figure 6.5 Comparing fixed tariff and local call prices with Chile and Argentina**



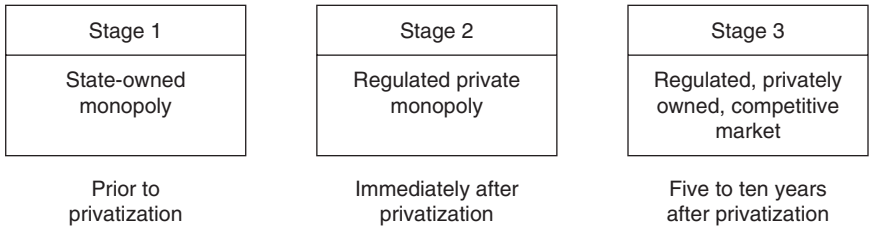

*Source:* Regulatory agencies of each country.

backbones.[17] However, Peru's market for long distance is not yet competitive, and prices remain higher than in many other South American countries. To date, contrary to expectations, no substantial increase in consumer gains has accrued from the privatization of long distance national and international calls.[18]

17. These will likely be needed for Internet and data traffic.

18. In Chile, the average tariff of its major international long distance providers (BellSouth and Manquehue) is significantly lower than that of Peru; for example, a one-minute call from Lima to the United States is 71 percent more expensive in terms of the regular tariff and 55 percent more expensive in terms of the reduced tariff than is a one-minute call from Santiago to the United States, even though BellSouth also operates in Peru.

**Figure 6.6 The three stages of Peru's telecommunications reform**




*Source:* Ramamurti (1996).

We expect that the entry of new firms—hindered to date by disputes concerning interconnection fees—will generate more competition for the dominant provider and exert downward pressure on prices in the future. This will require strengthening OSIPTEL, the telecommunications regulatory agency, allowing it to create and enforce the conditions needed to encourage new entry.

All observers agree that the greatest difficulty in liberalizing telecommunications is creating a competitive choice at the local level (Newbery 2000). Partly because of the technology involved, competitive markets are more easily introduced for long distance than for local services. Local companies can offer a bundle of local and long distance services, whereas long distance firms find it difficult to offer the full range of local services unless they can secure access to all local facilities. In the case of the Peruvian telecommunications market, lack of adequate interconnection policy and fees prevent other companies from using the incumbent infrastructure to compete in the local market. For more complete and larger welfare and distributional benefits to accrue, the obstacles to competition and new entry must be resolved.

Peru's privatization of telecommunications has involved a three-step process, as shown in figure 6.6. The government did not transform the telecommunications sector from a state monopoly (stage 1) into a competitive, privately owned sector (stage 3) in one swift step. Instead, it opted for a more gradual achievement of its aims, via an intermediate stage of regulated, private monopoly (stage 2). This decision was understandable and had much to do with the critical lack of infrastructure inherited from the state monopoly. The major risk with this intermediate step, however, was that the incumbent firm might become entrenched during stage 2, making it difficult even for industry giants, such as AT&T Latin America (FirstCom) or BellSouth to dislodge it in stage 3. New entrants might be expected to contest the incumbent firm's grip. To do so, however, the regulatory agency OSIPTEL must ensure in stage 3 that new entrants can readily interconnect with the monopolist's network on reasonable terms and compete with it fairly. Regulation is key.

Initially, OSIPTEL recommended an interconnection tariff of 2.9 cents, which gave TdP, the incumbent firm, excessive protection.[19] Then, in late August 2000, OSIPTEL reduced the interconnection fee, proposing that the average charge should fall to 1.68 cents by June 2001. OSIPTEL claimed that this fee was close to the average mid-2000 interconnection fee of 1.67 cents charged by a sample of 25 countries.[20] However, when one compares this fee with that of the three South American countries with the lowest interconnection costs—Brazil, Chile, and Colombia—one finds that their average interconnection cost by mid-2000 was 1.24 cents, significantly lower than the converging tariff proposed by OSIPTEL. We conclude that Peru's interconnection fee is still too high.

Increasing competition is a medium-term measure. To increase consumer surplus and more equitable distribution in the short run, we recommend two other measures. The validity of both requires that our estimated-demand calculations accurately describe the observed household-level consumption patterns.

First, we recommend reducing the unit of measurement for local calls from minutes to seconds (already done in many countries), which would indirectly reduce the local charge and therefore benefit consumers. Because most of the network is digitized, the costs of this switch would be negligible—although not necessarily neutral for the private provider.

Second, we recommend even more strongly the use of optional calling plans, in which volume discounts are given to large users (second-degree price discrimination). Conceptually, and as mentioned in Pasco-Font, Gallardo, and Fry (1999), introduction of differentiated prices can simultaneously generate a greater benefit for the company and larger consumer surplus for families. This is possible when consumer heterogeneity exists, allowing an increase in aggregate welfare of consumers on the regulatory side and the potential to discriminate prices from the company perspective.

For example, decreases in long distance prices have little benefit to low-income households, who purchase little or none of this good, either at the original, higher price or the new, lower one.[21] Therefore, balancing local-service price reductions with increases in long distance access charges would likely result in net welfare gains for many households.

---

19. The European Economic Commission's recommended range of interconnection cost was 1.10 to 2.11 cents, which it derived by taking the average of the three lowest charges of member countries. OSIPTEL adjusted these numbers to the Peruvian reality, taking into account the higher cost of capital and tax difference (see OSIPTEL 1999).

20. The 25 countries were Argentina, Austria, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, Holland, Ireland, Italy, Mexico, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, the United States, and Venezuela.

21. As more low-income people migrate to other areas and countries in search of work, they and their families will likely use more long distance services.

Moreover, it is reasonable to think that households from the lowest SEL use their phones primarily for receiving calls; therefore, their major burden is the fixed monthly rent. A calling plan with a low, fixed monthly tariff and a higher charge for local calls could also improve the welfare of low-income households. The opposite is true for wealthier households, whose major welfare gain is through intensive use of the phone. Their welfare would increase if local and long distance tariffs were reduced and the fixed monthly tariff increased. In either case, the central objective of not breaking the equilibrium in tariffs must be maintained to avoid entry of inefficient competitors.

From this discussion, it appears that Peru could have done better by moving directly from stage 1 to stage 3, without spending several years in stage 2. Admittedly, doing so might have robbed the government of the chance to solve fiscal problems through privatization or signal their commitment to market-oriented policies. Moreover, in the absence of those incentives, the sector might not have been reformed at all. The adage, better late than never, may well apply here. Nonetheless, while the overall results of telecommunications privatization have been good, we believe they could have been—and still could be—better.

## References


Coopers & Lybrand, Morgan Grenfell, and ProInversión. 1993. Telecommunications Sector Restructuring in Peru. Lima: OSPITEL.

Doherty, A. 1984. Empirical Estimates of Demand and Cost Elasticities of Local Telephone Service. In *Changing Patterns in Regulated Markets and Technology: The Effect of Public Utility Pricing.* Lansing, MI: Institute of Public Utility Pricing, Institute of Public Utilities, Michigan State University.

Duncan, G., and D. Perry. 1994. IntaLATA Toll Demand Modeling: A Dynamic Analysis of Revenue and Usage Data. *Information Economics and Policy* 6: 163–78.

Escobal, J., V. Fry, and E. Schroth. 1996. *Estudio de Demanda de Servicios Telefónicos.* Lima: GRADE.

Galal, A., L. Jones, P. Tandon, and I. Vogelsang. 1994. *Welfare Consequences of Selling Public Enterprises: An Empirical Analysis.* Oxford: Oxford University Press.

Gallardo, J., and V. Galdo. 1998. *Estudio de Demanda Comercial de Servicios Telefónicos.* Lima: GRADE.

Gatto, J., J. Langin-Hooper, P. Robinson, and H. Tyan. 1988. Interstate Switched Access Demand Analysis. *Information Economics and Policy* 3, no. 4 (November): 333–58.

Jones, L., P. Tandon, and I. Vogelsang. 1990. *Selling Public Enterprises. A Cost-Benefit Methodology.* Cambridge, MA: MIT Press.

Levy, A. 1996. Semi-Parametric Estimation of Telecommunications Demands. Ph.D. Dissertation. University of California, Berkeley.

Martin, S., and D. Parker. 1997. *The Impact of Privatization: Ownership and Corporate Performance in the UK.* London: Routledge.

Newbery, David M. 2000. *Privatization, Restructuring, and Regulation of Network Utilities.* The Walras-Pareto Lectures, 1995. Cambridge, MA: MIT Press.

OSIPTEL. 1994. Marco Legal de las Telecomunicaciones: Contratos de Concesión de Telefónica del Perú. *Temas de Telecomunicaciones,* no. 1.

OSIPTEL. 1995a. Marco Conceptual para la Implementación del Sistema de Contabilidad Separada. Lima.
OSIPTEL. 1995b. La Transformación de las Telecomunicaciones: Memoria 1994. Lima.
OSIPTEL. 1996. Regulación y Mercado de las Telecomunicaciones: Memoria 1995. Lima.
OSIPTEL. 1997. Apertura del Mercado de las Telecomunicaciones: Memoria 1996. Lima.
OSIPTEL. 1998a. Los Usuarios y las Telecomunicaciones: Memoria 1997. Lima.
OSIPTEL. 1998b. Cinco Años en el Mercado de las Telecomunicaciones: Memoria 1998. Lima.
OSIPTEL. 1999. *Estudio de Comparación Internacional de Cargos de Interconexión.* Gerencia de Políticas Regulatorias y Planeamiento Estratégico. Working Paper. Lima.
Pasco-Font, A., J. Gallardo, and V. Fry. 1999. La Demanda Residencial de Telefonía Básica en el Perú. In *Estudio en Telecomunicaciones,* no. 4. Lima: OSIPTEL.
Ramamurti, R. 1996. *Privatizing Monopolies: Lessons from the Telecommunications and Transport Sectors in Latin America.* Baltimore: John Hopkins University Press.
Taylor, L., and D. J. Kridel. 1990. Residential Demand for Access to the Telephone Network. In *Telecommunications Demand Modeling,* ed. A. de Frotenay, M. H. Shugard, and D. S. Sibley. Amsterdam: North Holland Publishing Co.
Torero, M., and A. Pasco-Font. 2000. *The Social Impact of Privatization and Regulation of Utilities in Urban Peru.* Helsinki: UNU/Wider.
Zona, J., and R. Jacob. 1990. The Total Bill Concept: Defining and Testing Alternative Views. Paper presented at Telecommunications Demand Analysis with Dynamic Regulation, Bellcore and Bell Canada Industry Forum, Hilton Head, South Carolina (April 22–25).

# Appendix 6A Tables

## Table 6A.1 Estimation of change in total welfare, discounting the fixed charge, for metropolitan Lima, 1993–98

| | | OLS estimations using Mills inverse ratio (reported bills)—discounted fixed charge | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Socio-economic level** | **Year** | **Average welfare** | **Welfare changes** | **Minimum welfare** | **Total households** | **Households with telephone** | **Penetration ratio** | **New households with telephone in t+1** | **Welfare per household** (weighted for access) **( W: 0 ->Min )** | **Welfare changes** (weighted for access) **( W: 0 ->Min)** |
| High (A) | 1993 | 86.10 | | 44.54 | 55,400 | 50,968 | 0.92 | 732 | 86.10 | |
| | 1994 | 124.46 | 0.446 | 60.87 | 51,700 | 51,700 | 1.00 | 0 | 122.70 | 0.425 |
| | 1995 | 131.01 | 0.053 | 64.12 | 56,800 | 56,800 | 1.00 | 0 | 131.01 | 0.068 |
| | 1996 | 133.20 | 0.017 | 63.45 | 56,400 | 56,400 | 1.00 | 0 | 133.20 | 0.017 |
| | 1997 | 138.87 | 0.043 | 65.02 | 62,100 | 62,100 | 1.00 | 0 | 138.87 | 0.043 |
| | 1998 | 99.86 | –0.281 | 44.03 | 62,100 | 62,100 | 1.00 | 0 | 99.86 | –0.281 |
| Medium (B) | 1993 | 38.68 | | 10.46 | 240,900 | 153,754 | 0.64 | 21,878 | 38.68 | |
| | 1994 | 52.90 | 0.368 | 9.80 | 252,000 | 175,632 | 0.70 | 31,868 | 48.09 | 0.243 |
| | 1995 | 55.87 | 0.056 | 10.23 | 273,700 | 207,500 | 0.76 | 9,922 | 47.78 | –0.006 |
| | 1996 | 55.01 | –0.015 | 6.84 | 259,200 | 217,422 | 0.84 | 25,134 | 53.29 | 0.115 |
| | 1997 | 56.23 | 0.022 | 4.92 | 278,800 | 234,192 | 0.84 | 5,954 | 50.32 | –0.056 |
| | 1998 | 37.03 | –0.342 | 2.54 | 278,800 | 248,510 | 0.89 | 13,562 | 36.28 | –0.279 |
| Low (C) | 1993 | 18.44 | | 2.50 | 494,700 | 50,693 | 0.10 | 24,632 | 18.44 | |
| | 1994 | 22.22 | 0.205 | 3.45 | 471,700 | 75,325 | 0.16 | 37,049 | 16.65 | –0.097 |
| | 1995 | 23.88 | 0.075 | 2.75 | 528,300 | 112,374 | 0.21 | 67,938 | 17.67 | 0.061 |
| | 1996 | 22.28 | –0.067 | 1.87 | 491,500 | 180,312 | 0.37 | 26,708 | 14.16 | –0.198 |
| | 1997 | 21.92 | –0.016 | 2.12 | 470,500 | 207,020 | 0.44 | 48,915 | 19.59 | 0.383 |
| | 1998 | 12.05 | –0.450 | 2.05 | 470,500 | 255,935 | 0.54 | 35,775 | 10.04 | –0.488 |
| Very low (D) | 1993 | 9.53 | | 2.45 | 562,900 | 5,629 | 0.01 | 316 | 9.53 | |
| | 1994 | 8.45 | –0.113 | 1.25 | 594,500 | 5,945 | 0.01 | –765 | 7.84 | –0.177 |
| | 1995 | 8.90 | 0.052 | 0.57 | 518,000 | 5,180 | 0.01 | 32,326 | 13.77 | 0.755 |
| | 1996 | 5.66 | –0.364 | 1.20 | 535,800 | 37,506 | 0.07 | 41,664 | 2.11 | –0.846 |
| | 1997 | 3.83 | –0.323 | 1.11 | 609,000 | 79,170 | 0.13 | 73,080 | 2.84 | 0.342 |
| | 1998 | 1.40 | –0.634 | 1.32 | 609,000 | 152,250 | 0.25 | 6,090 | 0.78 | –0.725 |

OLS = ordinary least squares

## Table 6A.2 Estimation of the change in total welfare, discounting the fixed charge, for principal cities outside Lima, 1993–98

| | | | OLS estimations using Mills inverse ratio (reported bills)—discounted fixed charge | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| City | Socio-economic level | Year | Average welfare | Welfare changes | Minimum welfare | Total households | Households with telephone | Penetration ratio | New households with telephone in t+1 | Welfare per household (weighted for access) (W: 0 ->Min) | Welfare changes (weighted for access) (W: 0 ->Min) |
| Arequipa | High/medium (A/B) | 1993 | 22.99 | | 10.06 | 24,815 | 13,400 | 0.54 | 3,861 | 22.99 | |
| | | 1994 | 34.59 | 0.504 | 11.37 | 25,383 | 17,261 | 0.68 | 2,005 | 28.17 | 0.225 |
| | | 1995 | 40.35 | 0.167 | 11.25 | 25,687 | 19,265 | 0.75 | 2,647 | 37.70 | 0.338 |
| | | 1996 | 40.15 | –0.005 | 7.51 | 26,401 | 21,913 | 0.83 | 664 | 35.52 | –0.058 |
| | | 1997 | 41.99 | 0.046 | 6.60 | 26,877 | 22,576 | 0.84 | 1,517 | 41.20 | 0.160 |
| | | 1998 | 38.16 | –0.091 | 1.64 | 27,379 | 24,093 | 0.88 | 821 | 35.82 | –0.131 |
| Cuzco | High/medium (A/B) | 1993 | 9.90 | | 3.79 | 9,280 | 5,011 | 0.54 | 1,357 | 9.90 | |
| | | 1994 | 11.12 | 0.123 | 0.14 | 9,365 | 6,368 | 0.68 | 795 | 8.77 | –0.114 |
| | | 1995 | 11.57 | 0.041 | –3.63 | 9,550 | 7,163 | 0.75 | 815 | 9.88 | 0.126 |
| | | 1996 | 8.39 | –0.276 | –9.83 | 9,611 | 7,977 | 0.83 | 191 | 7.29 | –0.262 |
| | | 1997 | 7.73 | –0.078 | –12.41 | 9,724 | 8,168 | 0.84 | 496 | 6.79 | –0.069 |
| | | 1998 | 4.23 | –0.453 | –19.75 | 9,846 | 8,665 | 0.88 | 295 | 3.31 | –0.512 |
| Trujillo | High/medium (A/B) | 1993 | 15.18 | | 4.69 | 22,223 | 12,000 | 0.54 | 3,437 | 15.18 | |
| | | 1994 | 21.14 | 0.393 | 2.39 | 22,702 | 15,437 | 0.68 | 1,826 | 16.72 | 0.101 |
| | | 1995 | 24.28 | 0.148 | –0.64 | 23,017 | 17,263 | 0.75 | 2,550 | 21.62 | 0.293 |
| | | 1996 | 22.82 | –0.060 | –6.27 | 23,587 | 19,813 | 0.84 | 4,206 | 18.55 | –0.142 |
| | | 1997 | 23.41 | 0.026 | –8.53 | 24,019 | 24,019 | 1.00 | 432 | 19.16 | 0.033 |
| | | 1998 | 21.17 | –0.096 | –14.96 | 24,451 | 24,451 | 1.00 | 0 | 20.79 | 0.085 |
| Chiclayo | High/medium (A/B) | 1993 | 17.77 | | 6.71 | 10,324 | 5,575 | 0.54 | 1,575 | 17.77 | |
| | | 1994 | 25.83 | 0.454 | 5.92 | 10,515 | 7,150 | 0.68 | 927 | 20.91 | 0.177 |
| | | 1995 | 30.05 | 0.163 | 4.92 | 10,769 | 8,077 | 0.75 | 1,015 | 27.22 | 0.302 |
| | | 1996 | 29.20 | –0.028 | 0.91 | 10,954 | 9,092 | 0.83 | 1,186 | 26.06 | –0.043 |
| | | 1997 | 30.30 | 0.038 | –0.43 | 11,171 | 10,277 | 0.92 | 1,122 | 26.76 | 0.027 |
| | | 1998 | 28.02 | –0.075 | –3.96 | 11,399 | 11,399 | 1.00 | 0 | 25.27 | –0.056 |

OLS = ordinary least squares